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8. AIR AND CLIMATE

8.1 Statement of Authority

This section of the EIAR has been prepared by Eoin Gilson and reviewed by John Staunton and Michael Watson, all MKO. Eoin is an Environmental Scientist with over 1 years' experience in private practice where he has completed numerous EIAs and has experience composing a variety of EIAR chapters; relating to residential development. He holds a BSc (Hons) in Science and a MSc. in Environmental Science.

John Staunton is a Project Environmental Scientist and Michael Watson is a Project Director with MKO; with over 10 and 17 years of experience in the environmental sector respectively. Their environmental experiences involve report writing of Environmental Reports (ER), Environmental Impact Statements/Environmental Impact Assessment Reports (EIS/EIAR) & Strategic Environmental Assessments (SEA) as well as project management of a variety of small- and large-scale jobs, including residential development projects.

8.2 Air

8.2.1 Background

The proposed Cornamagh residential development site, which is approximately 15.615ha, is located on the Coosan Road, which acts as a local distributor road linking the N55 (Athlone to Ballymahon/Cavan road) in the east and the Hillquarter/Castlequarter Road (L1482) in the west. The works will run for an overall length of approximately 3.5 years.

Due to the nature of the development, the general character of the surrounding environment and publicly available information on air quality, air quality sampling, was deemed to be unnecessary for this Environmental Impact Assessment Report (EIAR).

8.2.2 Air Quality Standards

In 1996, the Council Directive 96/62/ EC of 27 September 1996 on ambient air quality assessment and management, termed as the 'Air Quality Framework Directive' was published. This Directive was transposed into Irish law by the Environmental Protection Agency Act 1992 (Ambient Air Quality Assessment and Management) Regulations 1999 (S.I. No 33 of 1999). The Directive was followed by four Daughter Directives, which set out limit values for specific pollutants:

- The first Daughter Directive (1999/30/EC) addresses sulphur dioxide, oxides of nitrogen, particulate matter and lead.
- The second Daughter Directive (2000/69/EC) addresses carbon monoxide and benzene. The first two Daughter Directives were transposed into Irish law by the Air Quality Standards Regulations 2002 (S.I. No. 271 of 2002).
- The third Daughter Directive, Council Directive (2002/3/EC) relating to ozone was published in 2002 and was transposed into Irish law by the Ozone in Ambient Air Regulations 2004 (S.I. No. 53 of 2004). This is termed as the 'Ozone Daughter Directive 2002/3/EC'.
- The fourth Daughter Directive, Council Directive (2004/107/EC) relating to polyaromatic hydrocarbons (PAHs), arsenic, nickel, cadmium and mercury in ambient air, was transposed into Irish law by the Arsenic, Cadmium, Mercury, Nickel and Polycyclic Aromatic Hydrocarbons in Ambient Air Regulations 2009 (S.I. No. 58 of 2009).

The Air Quality Framework Directive and the first three Daughter Directives were repealed by Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on ambient air quality and cleaner air for Europe, termed as the 'CAFE Directive' which encompasses the following elements:

- The merging of most of the existing legislation into a single Directive (except for the Fourth Daughter Directive) with no change to existing air quality objectives.
- New air quality objectives for PM2.5 (fine particles) including the limit value and exposure concentration reduction target.
- The possibility to discount natural sources of pollution when assessing compliance against limit values.
- The possibility for time extensions of three years (for particulate matter PM10) or up to five years (nitrogen dioxide, benzene) for complying with limit values, based on conditions and the assessment by the European Commission.

Table 8-1 below sets out the limit values of the CAFE Directive, as derived from the Air Quality Framework Daughter Directives. Limit values are presented in micrograms per cubic metre (µg/m3) and parts per billion (ppb). The notation PM10 is used to describe particulate matter or particles of ten micrometres or less in aerodynamic diameter. PM2.5 represents particles measuring less than 2.5 micrometres in aerodynamic diameter.

The CAFE Directive was transposed in to Irish legislation by the Air Quality Standards Regulations 2011 (S.I. No. 180 of 2011) as amended by the Air Quality Standards (Amendments) and Arsenic, Cadmium, Mercury, Nickel and Polycyclic Aromatic Hydrocarbons in Ambient Air Regulations, 2016 (S.I. No. 659 of 2016). These Regulations revoke the Air Quality Standards Regulations 2002 (S.I. No. 271 of 2002), the Ozone in Ambient Air Regulations 2004 (S.I. No. 53 of 2004) and the Ambient Air Quality Assessment and Management Regulations 1999 (S.I. No. 33 of 1999).

Table 8-1 Limit values of Directive 2008/50/EC, 1999/30/EC and 2000/69/EC (Source: EPA)

Pollutant	Limit Value Objective	Averaging Period	Limit Value (µg/m³)	Limit Value (ppb)	Basis of Application of Limit Value	Attainment Date
Sulphur dioxide (SO_2)	Protection of Human Health	1 hour	350	132	Not to be exceeded more than 24 times in a calendar year	1st Jan 2005
Sulphur dioxide (SO_2)	Protection of human health	24 hours	125	47	Not to be exceeded more than 3 times in a calendar year	1st Jan 2005
Sulphur dioxide (SO_2)	Protection of vegetation	Calendar year	20	7.5	Annual mean	19th Jul 2001
Sulphur dioxide (SO_2)	Protection of vegetation	1st Oct to 31st Mar	20	7.5	Winter mean	19th Jul 2001
Nitrogen dioxide (NO_2)	Protection of human health	1 hour	200	105	Not to be exceeded more than 18 times in a calendar year	1st Jan 2010
Nitrogen dioxide (NO_2)	Protection of human health	Calendar year	40	21	Annual mean	1st Jan 2010
Nitrogen monoxide (NO) and nitrogen dioxide (NO_2)	Protection of ecosystems	Calendar year	30	16	Annual mean	19th Jul 2001

Particulate matter 10 (PM_{10})	Protection of human health	24 hours	50	-	Not to be exceeded more than 35 times in a calendar year	1st Jan 2005
Particulate matter 2.5 ($PM_{2.5}$)	Protection of human health	Calendar year	40	-	Annual mean	1st Jan 2005
Particulate matter 2.5 ($PM_{2.5}$) Stage 1	Protection of human health	Calendar year	25	-	Annual mean	1st Jan 2015
Particulate matter 2.5 ($PM_{2.5}$) Stage 2	Protection of human health	Calendar year	20	-	Annual mean	1st Jan 2020
Lead (Pb)	Protection of human health	Calendar year	0.5	-	Annual mean	1st Jan 2005
Carbon Monoxide (CO)	Protection of human health	8 hours	10,000	8,620	-	1st Jan 2005
Benzene (C_6H_6)	Protection of human health	Calendar Year	5	1.5	-	1st Jan 2010

The Ozone Daughter Directive 2002/3/EC is different from the other Daughter Directives in that it sets target values and long-term objectives for ozone rather than limit values. Table 8-2 presents the limit and target values for ozone.

Table 8-2 Target values for Ozone Defined in Directive 2008/50/EC. AOT40 is a measure of the overall exposure of plants to ozone. It is the sum of the excess hourly concentrations greater than 80 µg/m3 and is expressed as µg/m3 hours.

Objective	Parameter	Target Value for 2010	Target Value for 2020
Protection of human health	Maximum daily 8 hour mean	120 mg/m^3 not to be exceeded more than 25 days per calendar year averaged over 3 years	120 mg/m^3
Protection of vegetation	AOT_{40} calculated from 1 hour values from May to July	18,000 $mg/m^3.h$ averaged over 5 years	6,000 $mg/m^3.h$
Information Threshold	1 hour average	180 mg/m^3	-
Alert Threshold	1 hour average	240 mg/m^3	-

8.2.2.1 Air Quality and Health

A recent European Environmental Agency Report, 'Air Quality in Europe – 2018 Report' highlights the negative effects of air pollution on human health. The report assessed that poor air quality accounted for premature deaths of approximately 422,000 people in Europe in 2015, with regards to deaths relating to PM2.5. The estimated impacts on the population in Europe of exposure to NO2 and O3 concentrations in 2015 were around 79,000 and 17,700 premature deaths per year respectively, From this, 1,100 Irish deaths were attributable to fine particulate matter (PM2.5), 30 Irish deaths were attributable to nitrogen oxides (NO2) and 20 Irish deaths were attributable to Ozone (O3) (Source: Air Quality in Europe –

2018 Report', EEA, 2018). These emissions, along with others including sulphur oxides (SOx) are produced during fossil fuel based electricity generation in various amounts, depending on the fuel and technology used.

8.2.3 Air Quality Zones

The Environmental Protection Agency (EPA) has designated four Air Quality Zones for Ireland:

- Zone A: Dublin City and environs
- Zone B: Cork City and environs
- Zone C: 16 urban areas with population greater than 15,000
- Zone D: Remainder of the country.

These zones were defined to meet the criteria for air quality monitoring, assessment and management described in the Framework Directive and Daughter Directives. The site of the proposed development lies within Zone C, which represents urban areas with population greater than 15,000.

8.2.4 Existing Air Quality

The EPA publishes Air Monitoring Station Reports for monitoring locations in all four Air Quality Zones. The most recent ambient air quality monitoring carried out closest to the proposed development site is at Mullingar, Co, Westmeath, located approximately 40 kilometres north east of the proposed development site. EPA air quality data is available for Mullingar in the report 'Ambient Air Monitoring at Mullingar, Co. Westmeath 16th October 2012 – 17th June 2014', as detailed below. This monitoring location lies within Zone C. While there is a monitoring station in Athlone, the most recent ambient air quality monitoring report was published in 2003. The Mullingar dataset was utilised as it is located in Zone C and is the most up to date report.

8.2.4.1 Sulphur Dioxide (SO2)

Sulphur dioxide data for the 2013/2014 monitoring period in Mullingar is presented in Table 8-3. Neither the hourly limit value nor lower assessment threshold set out in the CAFE Directive were exceeded during the monitoring period.

Table 8-3 Sulphur Dioxide Data Mullingar October 2013 to June 2014

Parameter	Measurement
No. of hours	14,360
No. of measured values	14,117
Percentage Coverage	98%
Maximum hourly value	51.1 µg/m^3
98 percentile for hourly values	8.5 µg/m^3
Mean hourly value	2.5 µg/m^3
Maximum 24-hour value	31.7 µg/m^3
98 percentile for 24-hour value	6.8 µg/m^3

8.2.4.2 Particulate Matter (PM10)

Particulate matter (PM10) data for the 2013/2014 monitoring period in Mullingar is presented in Table 8-4. The 24-hour limit value for the protection of human health (50 µg/m3) was not exceeded during the measurement period. The upper assessment threshold (35 µg/m3) was exceeded on fifteen days and the lower assessment threshold (25 µg/m3) was exceeded on 48 days. The CAFE Directive stipulates that these assessment thresholds should not be exceeded more than 35 times in a calendar year. The mean of the daily values during the measurement period is below the annual limit value for the protection of human health (40 µg/m3).

Table 8-4 Particulate Matter (PM10) Data Mullingar October 2013 to June 2014

Parameter	Measurement
No. of days	464
No. of measured values	464
Percentage Coverage	74.8%
Maximum daily value	47.7 µg/m3
Mean daily value	13.6 µg/m3

8.2.4.3 Nitrogen Dioxide (NO2)

Nitrogen dioxide and oxides of nitrogen data for the 2013/2014 monitoring period in Mullingar are presented in Table 8-5. The CAFE Directive stipulates that this threshold should not be exceeded more than 18 times in a calendar year. The mean hourly value for the measurement period (5.6 µg/m3) is below the annual average limit of 40 µg/m3 and the lower assessment thresholds or limit values occurred during the monitoring programme.

Table 8-5 Nitrogen Dioxide and Oxides of Nitrogen Data Mullingar October 2013 to May 2014

Parameter	Measurement
No. of hours	11,488
No. of measured values	8,133
Percentage Coverage	71%
Maximum hourly value (NO2)	67.9 µg/m^3
99.7 percentile for hourly values (NO2)	40.2 µg/m^3
Mean hourly value (NO2)	5.6 µg/m^3
Mean hourly value (NOx)	11.1 µg/m^3 NO2

8.2.4.4 Carbon Monoxide (CO)

Carbon monoxide data for the 2013/2014 monitoring period in Mullingar is presented in Table 8-6. The mean hourly concentration of carbon monoxide recorded was 0.3 mg/m^3. On no occasions were values in excess of the 10 mg/m^3 limit value set out in the CAFE Directive recorded.

Table 8-6 Carbon Monoxide Data Mullingar October 2013 to May 2014

Hourly Values	Result
No. of hours	14,222
No. of measured values	14,158
Percentage Coverage	100%
Maximum hourly value	2.5 mg/m^3
98 percentile for hourly values	0.7 mg/m^3
Mean hourly value	0.3 mg/m^3
Maximum 8-hour mean	0.3 mg/m^3
98 percentile for 8-hour mean	0.7 mg/m^3

8.2.5 Likely Significant Effects and Associated Mitigation Measures

8.2.5.1 "Do-Nothing" Scenario

If the proposed development were not to proceed, there would be no change to existing air quality conditions in the area and therefore there would be no negative effects. There would be no potential for minor emissions to occur as a result of the construction and operational phases of the proposed development.

8.2.5.2 Potential Impacts of the Proposed Development

8.2.5.2.1 *Construction Phase*

Dust Emissions

The potential for dust to be emitted will depend on the type of activity being carried out in conjunction with environmental factors including levels of rainfall, wind speed and wind direction.

Dust generation rates depend on the site activity, particle size (in particular the silt content, defined as particles smaller than 75 microns in size), the moisture content of the material and weather conditions. Dust emissions are dramatically reduced where rainfall has occurred due to the cohesion created between dust particles and water and the removal of suspended dust from the air. It is typical to assume no dust is generated under "wet day" conditions where rainfall greater than 0.2 mm has fallen. Information collected from Mullingar Meteorological Station (1981-2010) identified that typically 209 days per annum are "wet". Thus, for greater than 57% of the time no significant dust generation will be likely due to meteorological conditions.

Mitigation

Dust control should be achieved by:

- Dampening down the dust at the source
- By the use of barriers such as debris netting on scaffolding around the building to block dust escaping where the building is within 10m of the site boundary where residential properties exist.
- Site road ways will be maintained in a stoned hard-core condition not allowing soil to accumulate which when dry can create dust.
- Wheel wash equipment will be set up at the site exit gate for all construction vehicles to pass through prior to leaving the site thus ensuring that no dirt etc. is transported outside the site onto the roadways.
- Plant and equipment that have the potential to create volumes of dust will have appropriate attachments to allow water source to dampen dust to not allow it to get airborne.
- Deploy Road Sweeper as required on External Roads.

Residual Impact

Short term Imperceptible Negative Impact

Significance of Effects

Based on the assessment above there will be no significant effects.

Exhaust Emissions

The construction of the proposed development will require the use of machinery and plant, thereby giving risk to exhaust emissions. This is likely to have a short to medium-term slight negative effect, which will be reduced through the use of the best practices mitigation measures as presented below.

Mitigation

- All construction vehicles and plant will be maintained in good operational order while onsite, thereby minimising any emissions that arise.
- All machinery will be switched off when not in use.

Residual Impact

Short term Imperceptible Negative Impact

Significance of Effects

Based on the assessment above there will be no significant effects.

8.2.5.2.2 *Operational Phase*

There will be no impact on human health from either dust emissions or exhaust emissions in the vicinity of the proposed development site once the development has been built and all construction vehicles and personal are offsite.

Any further works which may need to occur on site as part of maintenance and repairs during the operation of the site, may cause localised slight temporary dust or exhaust emissions, and is unlikely to have any negative significant impact on human health.

Mitigation

No mitigation will be required on site during the majority of the operational phase for the proposed development, as the impact is assessed as being imperceptible, and will not be noticed within the area which already contains many residential developments.

Residual Impact

No negative impact.

Significance of Effects

Based on the assessment above there will be no significant effects

Health Effects

Whilst the construction phase of the proposed development is likely to lead to imperceptible increases in dust and vehicle emissions, the implementation of the mitigation measures discussed above, and good management practices can prevent or minimise potential effects off-site. Good management practice consists of good site design and layout, adopting appropriate working methods, choosing the right equipment and ensuring that the workforce understands the company's responsibilities and is familiar with good working practice and dust suppression techniques. The potential for health effects are considered imperceptible as the potential for both exhaust and dust emissions will be limited and controlled through site layout design and mitigation measures.

8.2.5.2.3 *Cumulative Impact*

Potential cumulative effects on air quality between the proposed housing development and other developments in the vicinity were also considered as part of this assessment. It is noted that the other land use activities in the area are agriculture and residential or commercial land uses.

General Air Quality

Agriculture, light commercial activity, other local construction activities and the construction of the proposed development will require the consumption of fossil fuels and therefore will lead to a minor level of air emissions cumulatively. However, given the small-scale machinery use for pasture land in the area and with the implementation of the mitigation measures discussed above, there is unlikely to be cumulative impacts arising from the construction phase of the proposed development and other local existing developments, projects and plans.

Dust Emissions

Dust emissions from the other land use activities in the area are likely to be imperceptible. The potential for dust emissions from the construction phase of the proposed development exist but the residual effects will be imperceptible given the proposed mitigation measures.

8.3 Climate

8.3.1 Climate Change and Greenhouse Gases

Climate change is one of the most challenging global issues facing us today and is primarily the result of increased levels of greenhouse gases in the atmosphere. These greenhouse gases come primarily from the combustion of fossil fuels in energy use. Changing climate patterns are thought to increase the frequency of extreme weather conditions such as storms, floods and droughts. In addition, warmer weather trends can place pressure on animals and plants that cannot adapt to a rapidly changing environment. Moving away from our reliance on coal, oil and other fossil fuel-driven power plants is essential to reduce emissions of greenhouse gases and combat climate change.

8.3.1.1 Greenhouse Gas Emission Targets

Ireland is a Party to the Kyoto Protocol, which is an international agreement that sets limitations and reduction targets for greenhouse gases for developed countries. It is a protocol to the United Nations Framework for the Convention on Climate Change. The Kyoto Protocol came into effect in 2005, as a result of which, emission reduction targets agreed by developed countries, including Ireland, are now binding.

Under the Kyoto Protocol, the EU agreed to achieve a significant reduction in total greenhouse gas emissions in the period 2008 to 2012. Ireland's contribution to the EU commitment for the period 2008 – 2012 was to limit its greenhouse gas emissions to no more than 13% above 1990 levels.

8.3.1.1.1 *Doha Amendment to the Kyoto Protocol*

In Doha, Qatar, on 8th December 2012, the "Doha Amendment to the Kyoto Protocol" was adopted. The amendment includes:

- New commitments for Annex I Parties to the Kyoto Protocol who agreed to take on commitments in a second commitment period from 1 January 2013 to 31 December 2020;
- A revised list of greenhouse gases (GHG) to be reported on by Parties in the second commitment period; and

- Amendments to several articles of the Kyoto Protocol which specifically referenced issues pertaining to the first commitment period and which needed to be updated for the second commitment period.

During the first commitment period, 37 industrialised countries and the European Community committed to reduce GHG emissions to an average of five percent against 1990 levels. During the second commitment period, Parties committed to reduce GHG emissions by at least 18 percent below 1990 levels in the eight-year period from 2013 to 2020; however, the composition of Parties in the second commitment period is different from the first.

Under the protocol, countries must meet their targets primarily through national measures, although market based mechanisms (such as international emissions trading can also be utilised).

8.3.1.1.2 COP21 Paris Agreement

COP21 was the 21st session of the Conference of the Parties (COP) to the United Nations Convention. Every year since 1995, the COP has gathered the 196 Parties (195 countries and the European Union) that have ratified the Convention in a different country, to evaluate its implementation and negotiate new commitments. COP21 was organised by the United Nations in Paris and held from 30th November to 12th December 2015.

COP21 closed on 12th December 2015 with the adoption of the first international climate agreement (concluded by 195 countries and applicable to all). The twelve-page text, made up of a preamble and 29 articles, provides for a limitation of the temperature rise to below 2°C above pre-industrial levels and even to tend towards 1.5°C. It is flexible and takes into account the needs and capacities of each country. It is balanced as regards adaptation and mitigation, and durable, with a periodical ratcheting-up of ambitions.

8.3.1.1.3 Emissions Projections

Ireland's target is to achieve a 20% reduction of non-Emissions Trading Scheme (non-ETS) sector emissions, i.e. agriculture, transport, residential, commercial, non-energy intensive industry and waste, on 2005 levels, with annual binding limits set for each year over the period 2013 – 2020. In May 2018, the EPA published an update on Ireland's Greenhouse Gas Emission Projections to 2035, '*Ireland's Greenhouse Gas Emissions Projections 2017 – 2035*' (Environmental Protection Agency, 2018).

The 2018 report states that the "*latest EPA greenhouse gas emissions projections indicate an overall increase in greenhouse gas emissions from most sectors. The projected growth in emissions is largely underpinned by projected strong economic growth and relatively low fuel prices leading to increasing energy demand over the period".*

Greenhouse gas emissions are projected to 2035 using two scenarios; 'With Existing Measures' and 'With Additional Measures'. The 'With Existing Measures' scenario assumes that no additional policies and measures, beyond those already in place by the end of 2014 are implemented. The 'With Additional Measures' scenario takes into account an expected shortfall in achieving full energy efficiency targets and renewable targets for electricity, transport and heat as set out in the National Energy Efficiency Action Plan and National Renewable Energy Action Plan.

The EPA Greenhouse Gas Emission Projections notes the following key trends:

- Ireland's non-Emissions Trading Scheme (ETS) emissions are projected to be 0% and 1% below 2005 levels in 2020 under the 'With Measures' and 'With Additional Measures' scenarios, respectively. The target for Ireland is a 20% reduction.
- Over the period 2013 – 2020, Ireland is projected to cumulatively exceed its compliance obligations by 17 Mt CO_2 (metric tonnes of Carbon Dioxide) equivalent under the 'With Measures' scenario and 16.3 Mt CO_2equivalent under the 'With Additional Measures' scenario.

The EPA report states that "*Ireland is not projected to meet 2020 emissions reduction targets and is not on the right trajectory to meet longer term EU and national emission reduction commitments*". The report also states:

> *Fossil fuels such as coal and peat continue to be key contributors to emissions from the power generation sector and the extent of their use will be a key determinant in influencing future emissions trends from this sector. Total emissions are projected to increase from current levels by 1% and 4% by the end of 2020 and 2030 respectively under the With Existing Measures scenario. Under the With Additional Measures scenario emissions are estimated to increase by 2% by 2020 and decrease by 1% by 2030. Ireland is not on the right long term trajectory in meeting national 2050 targets in the electricity generation, built environment and transport sectors ('Greenhouse Gas Emission Projections 2017 - 2035,* EPA, 2018).

8.3.1.1.4 Progress to Date

The 'Europe 2020 Strategy' is the EU's agenda for growth and jobs for the current decade. The Europe 2020 Strategy targets on climate change and energy include:

- Reducing greenhouse gas (GHG) emissions by at least 20% compared with 1990 levels;
- Increasing the share of renewable energy in final energy consumption to 20%; and
- Moving towards a 20% increase in energy efficiency.

Further details on the Europe 2020 Strategy are included in Section 2.2.3.3 of this EIAR in Chapter 2: Background to the Proposed Development. Regarding progress on targets, the *'Europe 2020 indicators – climate change and energy'* report provides a summary of recent statistics on climate change and energy in the EU.

In 2015, EU greenhouse gas emissions, including emissions from international aviation and indirect carbon dioxide (CO2) emissions, were down by 22.1% when compared with 1990 levels. However, regarding the progress of individual Member States, and Ireland in particular, the Europe 2020 indicators include the following statements:

- 24 countries are on track to meet their GHG targets, except Austria, Belgium, Ireland and Luxembourg.
- Luxembourg emitted the most GHG per capita in the EU in 2014 ... followed by Estonia, Ireland, the Czech Republic and the Netherlands.
- In 2014, France, the Netherlands, the United Kingdom and Ireland were farthest from reaching their national targets.

The June 2018 'Off Target Report' published by the Climate Action Network (CAN) Europe which ranks EU counties ambition and progress in fighting climate change listed Ireland as the second worst performing EU member state in tackling climate change. It also stated that Ireland is set to miss its 2020 climate and renewable energy targets and is also off course for its unambitious 2030 emissions target. In June 2019, the Climate Action Plan was released which outlines the steps involved in reaching the overall target of a 30% reduction in greenhouse gases by 2030.

8.3.2 Climate and Weather in the Existing Environment

Ireland has a temperate, oceanic climate, resulting in mild winters and cool summers. The Met Éireann weather station at Mullingar, Co. Westmeath, is the nearest weather and climate monitoring station to the proposed development site that has meteorological data recorded for the 30-year period from 1979 - 2008. The monitoring station is located approximately 40 kilometres north east of the site. Meteorological data recorded at Mullingar over the 30-year period from 1979-2008 is shown in Table 8-7 overleaf. The wettest months are October and December, and July is usually the driest. July is the warmest month with a mean daily temperature of 19.2° Celsius.

8.3.2.1 Wind

The wind field characteristics of the area are important climatological elements in examining the potential for the generation of fugitive dust emissions from the site. Fugitive dust emissions from a surface occur if the winds are sufficiently strong and turbulent and the surface is dry and loose, together causing re-suspension of particulate matter from the ground. A wind speed at ground level in excess of about five metres per second is considered to be the threshold above which re-suspension of fine sized material from an exposed surface may occur. The surface needs to have a relatively low moisture content for this type of dust emission to take place and any wetting either by rainfall or sprayers, will greatly reduce the potential of fugitive dust emissions. The mean annual wind speed at the station, in Mullingar, is 3.9 metres per second.

8.3.2.2 Rainfall

Long term rainfall data was also obtained from the Met Éireann monitoring station at Mullingar. The 30-year annual average rainfall is 941 mm/yr. This is considered to be high when compared to the annual average rainfall for Dublin (Merrion Square) which recorded annual average rainfall of 730 mm/yr over the same period. This will likely be due to Mullingar's more westerly location when compared to Dublin.

Table 8-7 Data from Met Éireann Weather Station at Mullingar, 1979 to 2008: Monthly and Annual Mean and Extreme Values

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
TEMPERATURE (degrees Celsius)													
Mean daily max	7.4	7.9	9.8	12.1	14.9	17.3	19.2	18.9	16.7	13.2	9.9	7.9	12.9
Mean daily min	1.5	1.5	2.8	4.1	6.3	9.2	11.1	10.8	8.9	6.2	3.5	2.2	5.7
Mean temperature	4.5	4.7	6.3	8.1	10.6	13.2	15.2	14.8	12.8	9.7	6.7	5	9.3
Absolute max.	13.8	15.4	19.1	21.6	25	28.3	29.7	29.1	25	20.1	17.3	14.6	29.7
Absolute Min.	-14.9	-6.6	-8.0	-4.4	-2.6	0.2	3.8	2.1	0.0	-4.4	-6.9	-12.4	-14.9
Mean No. of Days With Air Frost	9.9	8.9	5.5	3.1	0.4	0.0	0.0	0.0	0.0	1.5	5.4	8.2	43.0
Mean No. of Days With Ground Frost	17.9	16.2	14.0	10.8	5.1	0.8	0.0	0.1	1.7	6.3	12.1	15.4	100.4
RELATIVE HUMIDITY (%)													
Mean at 0900UTC	90.8	89.8	87.6	81.9	78.3	79.7	82.1	84.8	87.6	89.9	91.7	91.8	86.3
Mean at 1500UTC	83.4	77.8	72.8	68.1	67.1	69.1	69.9	70.6	72.1	77.0	82.2	85.9	74.7
SUNSHINE (hours)													
Mean daily duration	1.8	2.5	3.2	4.9	5.8	5.0	4.6	4.6	3.9	3.2	2.2	1.6	3.6
Greatest daily duration	8.2	9.9	10.9	13.6	15.4	15.9	15.3	14.4	12.2	10.1	8.6	7.3	15.9
Mean num. of days with no sun	10.3	7.2	5.3	2.9	1.9	2.2	1.8	1.9	3.3	5.7	8.4	11.0	62.0
RAINFALL (mm)													
Mean monthly total	91.7	72.0	78.3	62.1	68.7	70.5	61.8	80.8	73.8	102.1	82.4	97.1	941.3
Greatest daily total	30.3	24.7	29.5	27.6	26.1	52.9	26.6	58.2	42.1	48.8	43.7	38.8	58.2
Mean num. of days with >= 0.2mm	19	17	20	15	16	16	16	17	17	19	18	19	209
Mean num. of days with >= 1.0mm	15	13	15	11	12	11	11	13	12	14	13	14	154
Mean num. of days with >= 5.0mm	6	5	5	4	5	4	3	5	4	6	6	7	60
WIND (knots)													
Mean monthly speed	9.0	9.1	9.1	7.7	7.3	6.7	6.4	6.3	6.7	7.5	7.8	8.3	7.6
Max. gust	67	71	59	56	58	48	48	50	51	59	62	73	58.5
Max. mean 10-minute speed	38	36	36	30	34	26	27	28	32	36	32	39	32.8
Mean num. of days with gales	0.3	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.2	0.8
WEATHER (mean no. of days with..)													
Snow or sleet	5.0	4.4	3.5	1.6	0.2	0.0	0.0	0.0	0.0	0.0	0.4	2.7	17.8
Hail	0.6	0.9	2.0	2.0	1.1	0.2	0.1	0.1	0.1	0.5	0.2	0.3	8.1
Thunder	0.1	0.2	0.2	0.3	0.9	0.9	1.2	0.8	0.1	0.1	0.1	0.1	4.9
Fog	3.4	3.0	2.4	2.0	1.8	1.3	1.9	2.9	4.0	4.1	4.1	4.3	35.1

8.3.3 Likely Significant Effects and Associated Mitigation Measures

8.3.3.1 Construction Phase

The use of machinery during the construction of the proposed development may result in the emission of greenhouse gases. Operations such as the transport of equipment and materials as well as earth moving are typical examples of machinery use. This impact is considered to be imperceptible given the insignificant quantity of greenhouse gases that are emitted.

8.3.3.2 Operational Phase

The proposed development will be landscaped with green areas and trees. The proposed scheme is designed to comply with Part L 2008 requirements for energy performance and greenhouse gas emissions. The development is targeting an A rated BER certification. Therefore, the climate impacts from the proposed development are expected to be imperceptible.

8.3.3.3 Cumulative Impact

The construction of the proposed development and farming operations will require plant items which consume fossil fuels and therefore will lead to a minor emission of greenhouse gases cumulatively. However, given the small-scale farming operations and proposed mitigation measures for the proposed development, the cumulative impacts are likely to be imperceptible.

8.3.3.4 Mitigation Measures

As the proposed development, will have no significant negative impacts or effects on climate, mitigation measures are not proposed other than all construction machinery and plant will be maintained in good operational order while on-site and damping down of the operational areas will be carried out to reduce dust emissions, minimising any emissions that are likely to arise.

8.3.3.5 Residual Impact

There will be a permanent neutral impact on climate associated with the proposed project.